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A PROPOSED ACTION PLAN FOR A NATIONAL TRAINING PROGRAM IN THE WATER SECTOR FOR THE HASHEMITE KINGDOM OF JORDAN

WASH FIELD REPORT NO. 34

SEPTEMBER 1982

Prepared For:
USAID Mission to the Hashemite
Kingdom of Jordan
Order of Technical Direction No. 55

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FOR HEALTH PROJECT



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September 25, 1982

T-55

Mr. Walter G. Bollinger
Mission Director
USAID/Amman
Amman, Jordan

Attn: Jim Cassanos

Dear Mr. Bollinger:

On behalf of the WASH Project I am pleased to provide you with ten (10) copies of a report on a Training Program for the Jordan Water Sector. This is the final report by John Austin, Ken Woolf and Walter Pinto Costa and is based on their trip to Jordan from November 1 to November 18, a series of meetings with Boulos Kefaya and Aref Baha Eddin during their U.S. visit from January 25 to February 11, 1982, and subsequent correspondence with the Mission.

This assistance is the result of a request by the Mission in June, 1981. The work was undertaken by the WASH Project on September 12, 1981 by means of Order of Technical Direction No. 55, authorized by the USAID Office of Health in Washington.

If you have any questions or comments regarding the findings or recommendations contained in this report we will be happy to discuss them.

Sincerely,

Dennis B. Warner
Project Director
WASH Project

DBW:CRH:dcz

cc: Mr. Victor Wehman, S&T/H/WS
T-55 file

WASH FIELD REPORT NO. 34

HASHEMITE KINGDOM OF JORDAN

9311176

A PROPOSED ACTION PLAN FOR A NATIONAL
TRAINING PROGRAM IN THE WATER SECTOR
FOR THE HASHEMITE KINGDOM OF JORDAN

Prepared for the USAID Mission
to the Hashemite Kingdom of Jordan
under Order of Technical Direction No. 55

Prepared by:

John H. Austin, Ph.D.
Kenneth Woolf, Ed.D., P.E.
and
Walter Pinto-Costa, Ing.

September, 1982

Water and Sanitation for Health Project
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U.S. Ac

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ABBREVIATIONS

AID	Agency for International Development
AWSA	Amman Water and Sewerage Authority
GTZ	German Agency for Technical Cooperation, Ltd.
JIPA	Jordan Institute of Public Administration
JMI	Jordan Management Institute
JVA	Jordan Valley Authority
MMRAE	Ministry of Municipal and Rural Affairs, Environment
NPC	National Planning Council
NRA	Natural Resources Authority
ODA	Overseas Development Administration (UK)
OJT	On-the-Job Training
UK	United Kingdom
US	United States
VTC	Vocational Training Corporation
WASH	Water and Sanitation for Health
WSC	Water Supply Corporation

EXECUTIVE SUMMARY

At the request of the Government of Jordan, and USAID/Amman, the WASH project was asked to assist in developing a national action plan for training in the water sector. In September 1981 USAID/Washington issued Order of Technical Direction (OTD) 55 authorizing a three-person WASH team to work in Jordan in October-November 1981. As a result of their discussions with key personnel in sector organizations as well as organizations supplying personnel to the water sector, a number of factors were outlined that would influence the development of such a plan. Broadly these included:

- The need to coordinate the activities of several organizations with a role in the water sector.
- The need to provide immediate technical assistance to existing facilities and those to come on stream soon.
- The need to provide assistance to training and education organizations on subject matter to be included in their training and educational programs.
- The need to examine personnel policies and salary scales to determine if changes can be instituted to improve the retention of employees and instructors in the water sector, and to entice young people into water sector professions.

Because of the impact a successful training program can have on the Government's commitment to the water sector, it was strongly suggested that the proposal outlined in the report be implemented as quickly as possible.

The following major recommendations were made:

1. That a project be initiated in WSC to plan and implement a water sector training program for AWSA, JVA, NRA and WSC.
2. That VTC play a major role in designing and implementing training systems as well as skill training programs along with technical expertise from AWSA, JVA, NRA, and WSC.
3. That the project be a joint effort of expatriate trainers, full-time Jordanian staff, and personnel seconded from Jordanian water sector organizations and Jordanian training/education organizations.

A five-year plan is described which will allow the Government of Jordan to develop a comprehensive training program. A mix of overseas study tours and expatriate specialists is used to develop the needed training expertise.

A detailed initial 18-month plan for a series of courses to meet immediate needs is outlined, along with a systematic development of skills in task analysis, needs assessment, training methodologies, training trainers, job description preparation and performance problem solving.

Two additional phases of the project, a second 18-month phase and a final two-year phase are outlined. During these phases there is decreased use of outside specialists.

External costs for the phases are:

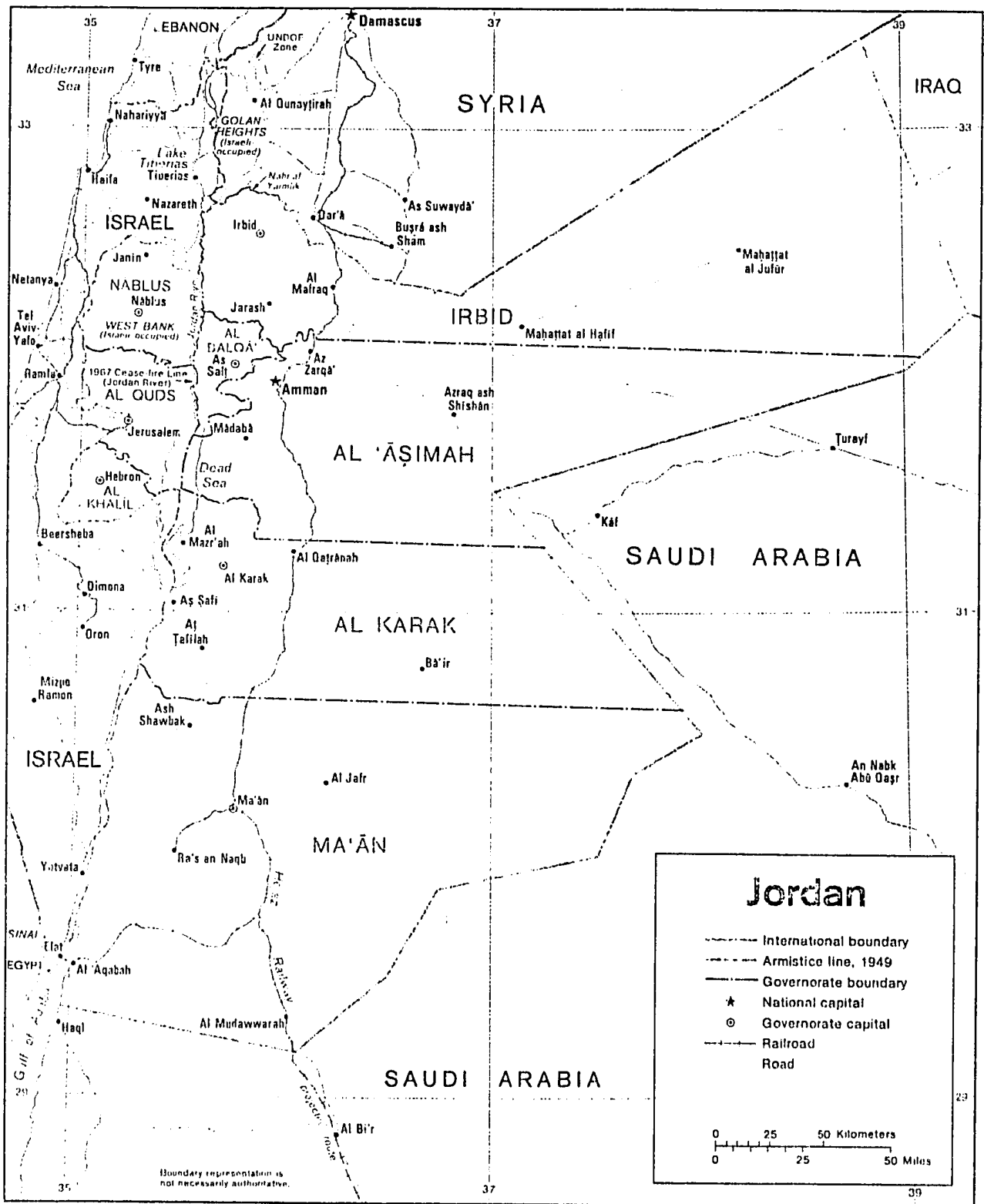
	Donor	Jordan
Phase I	\$ 610,720	\$ 385,000
Phase II	257,760	--
Phase III	<u>223,920</u>	--
Total	\$ 1,092,400	

ACKNOWLEDGEMENTS

Completing the scope of the assignment within the limited time available would never have been possible without the full cooperation and support of the U.S. Agency for International Development (USAID) Mission in Amman and the Government of Jordan.

Specifically, the contribution of Mr. Boulos Kefaya of the National Planning Council was essential to the success of this effort and one for which each member of the team is most appreciative. The guidance and assistance of Mr. James Cassanos, USAID Sanitary Engineer, served as both encouragement and support throughout the assignment. The assistance of Mr. Abdullah Ahmad of USAID in various aspects of the work is also appreciated.

To these individuals and others, the team expresses gratitude for making this assignment a memorable and pleasant experience.



Chapter 1

INTRODUCTION

The Kingdom of Jordan is confronted with the need to design, develop and implement a comprehensive training program for personnel at various levels within Jordan's water sector. Such an undertaking, particularly in light of limited training experience in this sector, is one that has exceeded the country's current training capacity.

At the present time major water sector* projects are being designed, constructed or have been recently completed. These include installations for Amman, Irbid, Zarqa-Ruseifa, Salt, Jarash, Madaba, Karak, Tafilah, Ma'an and Aqaba. In addition to these water and wastewater facilities, large-scale water extraction and transmission facilities are either being designed or are under construction. These include the extraction and transmission of water from Azraq Springs to Amman, transmission and treatment of water from the East Ghor Canal to Amman, transmission of water from the Qa Disi wellfield to Aqaba and eventually transmission and treatment of water from the Maqarin reservoir to Irbid. In addition a large water diversion project from the Euphrates is in the early discussion stages. These facilities and their operation will be the responsibility of the Amman Water and Sewerage Authority (AWSA), the Jordan Valley Authority (JVA), and the Water Supply Corporation (WSC).

These installations must have adequate numbers of properly trained personnel for the efficient management, operation and maintenance of these large-scale capital works. Table 1 describes present staffing patterns and future needs for the major organizations in the water sector, and it includes data from consultant reports on two new facilities. A more detailed analysis of the available data is given in Table 4, page 14.

Although these data indicate an immediate need for approximately 600 newly-trained entry-level personnel within one year, the demand for a training capability is further increased if one considers the 2,506 current employees, most of whom are likely to require additional skills and knowledge. In addition, it is estimated that water sector personnel will increase to 4,000 by 1987.

Jordan is not without resources that can assist with this effort. The universities, polytechnic and community college system have already started to respond by planning curricula and courses in the water sector. These efforts will contribute

* The term "water sector" includes both water supply and sewage treatment systems.

Table 1. Water Sector Staffing⁷

ORGANIZATION	PERSONNEL		Total
	Employed as of October 1981	Needed by end of 1982	
Amman Water and Sewerage Authority (AWSA) ¹	928	142	1,070
Natural Resources Authority (NRA) ²	240	136	376
Jordan Valley Authority (JVA) ³	—*	60	60
Water Supply Corporation (WSC) ⁴	1,205	39	1,244
Irbid Plant ⁵	133	28	161
Zarqa-Ruseifa Plant ⁶	—**	193	193
TOTAL	2,506	598	3,104

* Information not supplied

** Not in operation

¹See Ref. 4

²Information supplied by NRA

³Information supplied by JVA and Ref. 7

⁴Information supplied by WSC

⁵See Ref. 8

⁶See Ref. 6

⁷As of November 1981

toward solving the long-term needs as graduates become employed and gain practical experience in the field. Two additional organizations that have the capability of assisting with training in the water sector are the Vocational Training Corporation (VTC) and the Jordan Institute of Public Administration (JIPA). The existing training facilities and organizations of AWSA, JVA, NRA and WSC need to be incorporated into the development and implementation of this proposed plan. As outlined in Chapter 8 (Section 8.2) staff from the above organizations' training groups will provide technical expertise. This expertise plus the training expertise of VTC will form the basis for development of water sector training self sufficiency in Jordan.

The challenge presently confronting the Jordanian government is characterized by the need to:

1. Develop a mechanism for identifying manpower needs and focusing Jordanian training resources on these needs.
2. Contract for consultative assistance where local capability is not adequate.
3. Implement these actions with a minimum of delay.

This report includes a proposal that responds to the immediate training needs of the water sector and for which funding is required before implementation can take place.

Chapter 2

BACKGROUND

2.1 Initial Project Definition

In the spring of 1980, the National Planning Council considered the large financial commitment being made by the Government to the water sector. Deliberations eventually focussed on the anticipated demand for trained personnel to operate, maintain and manage these new facilities. Such a demand would require a broad-scale training effort aimed specifically at the needs of the water sector.

These deliberations led to the setting of two sets of objectives, one for the short term and one for the long term. The short term objectives include:

- Identification of training needs
- Design of a training program
- Implementation of selected programs
- Evaluation of results

The long-term objectives were to include:

- Establishment of a regional training center
- Establishment of a trainer training school
- Establishment of an operator certification program
- Establishment of a monitoring and surveillance agency
- Establishment of an educational program directed at the general public

2.2 Summary of Background Information

During the initial conceptualization of the proposed manpower project many documents were reviewed and discussions held with Government officials. This background information may be summarized in the following list:

- There are 15 organizations involved in some aspect of either employing, training or educating personnel for the water sector. Organizations included are:
 1. Amman Water and Sewerage Authority
 2. Community College System

3. Jordan Institute of Public Administration
4. Jordan Management Institute
5. Jordan Valley Authority
6. Ministry of Education
7. Ministry of Health
8. Ministry of Municipal and Rural Affairs,
Environment
9. National Planning Council
10. Natural Resources Authority
11. Polytechnic Institute
12. University of Jordan
13. Vocational Training Corporation
14. Water Supply Corporation
15. Yarmouk University

- A Training Program Development Committee has been formed and was in the process of exploring the water sector training needs.*
- The Government of Jordan has begun thinking about some sort of national water authority that would have the responsibility of coordinating water sector activities, including water sector training. However, progress toward creating this entity was not sufficient at the time of this study to suggest any direct linkages with this proposed authority.
- There is limited communication between the organizations needing the personnel and the organizations training or educating persons for employment.
- AWSA, JVA, NRA and WSC have been establishing their own training programs, independent of the training and educational organizations created for this purpose.
- There will be a rapid increase in the number of water and sewerage facilities coming into operation in the next five years.
- No single entity in the country is specifically concerned with coordinating the training needs and responses in this sector.
- No single person, in any of the organizations providing training and education services, has been authorized to serve as coordinator of these activities.

* This committee and its individual members met with the team and provided the majority of the data and information supplied to the team. Their assistance was very valuable.

- Communication needs to improve between senior level management of the 15 organizations.
- There is limited technical expertise available to assist with operational problems at water and sewerage facilities.
- There are limited training system development personnel available to translate training needs into training activities.
- There is a dependence on consultants and contractors to provide the bulk of the training but consulting engineers tend to vary in their approach to developing training programs for the start-up, operation, maintenance and management of facilities.
- There has been some inefficient utilization of those personnel who have completed study tours overseas.
- There is a limited supply of training materials for use by trainers and trainees in Arabic, as well as other languages.
- Each organization allocating funds for training or education does so independently of the other.
- Present personnel policies reward employees for length of service rather than quality of performance, improved knowledge and skills gained through experience and/or training and education.
- Present promotion and pay policies of training and education organizations as well as organizations providing water and sewerage services limit the recruitment and retention of qualified instructors and employees and do not encourage young people to enter the water sector.
- Competition from the private sector within Jordan and in other countries siphons off qualified employees and instructors.

Chapter 3

METHODOLOGY

3.1 Preliminary Preparations

Prior to arrival in Jordan documents pertinent to the scope of work were reviewed by the team. Interviews were held with persons familiar with the water sector and training capability in Jordan.

3.2 Training Program Development Committee

Early in the effort a meeting was held with the Training Program Development Committee. This committee is composed of a number of organizations concerned with the development of a training program for the water sector. Representatives from the following organizations were in attendance at the meeting:

- National Planning Council
- Amman Water and Sewerage Authority
- Water Supply Corporation
- Vocational Training Corporation
- Amman Polytechnic
- Ministry of Municipal and Rural Affairs, and Environment
- Jordan Valley Authority
- National Resources Authority
- Agency for International Development

The scope of work for the team was further defined and arrangements were made for discussions with officials of each organization and also with personnel from other organizations who were not represented in the above committee but had an interest in training in the water sector.

3.3 Interviews

While the team was in Jordan, interviews were arranged with as many organizations as possible that could supply background material on the scope of work and provide insight into train-

ing needs. Training and educational organizations also contributed information on their ability to respond to needs as well as delineated their requirements to better assist the water sector in preparing personnel. Appendix A contains a list of persons contacted.

3.4 References

Additional information was supplied in reports and documents which are listed in Appendix B.

Chapter 4

EXISTING AND FUTURE FACILITIES

4.1 Organizations Providing Water Sector Services

The water sector in Jordan has reached a fair level of development but is complicated by the many entities involved. The purpose of the proposed "National Water Authority" is to coordinate and combine these entities. While it is generally agreed that training will play an important role in the institutional development process, a clearer understanding of what is needed still remains to be developed. Therefore, the assessment for training needs will necessarily start with the analysis of each organization's requirements.

4.1.1 Amman Water and Sewerage Authority (AWSA)

AWSA is responsible for the Water Supply and Sewerage in Amman including the management, operation and maintenance of the facilities. Amman's present population is estimated to be 700,000. AWSA provides water for 546,000 (78 percent) and sanitary sewers for 385,000 (55 percent) through house connections. The goals for 1990 are to provide 100 percent of the population with connected water supplies and 85 percent with sanitary sewers.

The existing contracts and others in the financing process for expanding facilities make those goals attainable despite anticipated population growth and expansion of population into areas not yet provided with facilities.

The AWSA's largest facility is the Ain Ghazal Sewage Treatment Plant. Expansion of the existing plant is underway. There are plans for construction of a new plant at the same site, and another at Upper Wadi Abdoun, as shown in Table 2.

The planned facilities include a new water supply source from East Ghor Main Canal, which will start up in 1984 (Table 3). In addition other efforts under consideration are the Euphrates and Azraq/Amman Projects.

4.1.2 Water Supply Corporation (WSC)

The WSC is responsible for water supply for all Jordan except Amman and the Jordan Valley. The WSC supplies water to most municipalities in bulk and charges the municipalities for water consumed through a meter. WSC does not operate distribution systems in those municipalities and therefore does not know how much water is unaccounted for.

Table 2. Year of Start-up, Population Served and Type
of Wastewater Plants in Jordan.³

Wastewater Treatment Plants	Start-Up	Population Served (Estimate)	Type ¹
AMMAN - Existing Plant in Operation	1981	701,000	AS
AMMAN - Expansion of Existing Plant	1985	-- ²	AS-RF
AMMAN - New Plant at Same Site	1985	1,000,000	AS-RF
AMMAN & WADI SEER - New Plant at Wadi Abdoun	1986	-- ²	AS-RF
AQABA	1984 ⁴	32,000	OP
ZARQA-RUSEIFA	1986	323,000	TF
SALT - In Operation	1981	39,000	EA
JARASH - Under Construction	1982	11,000	EA
IRBID - Under Design	1984	137,000	RF-AS
MADABA - Feasibility Study	1986	36,000	ND
KARAK - Feasibility Study	1986	15,000	ND
TAFILA - Feasibility Study	1986	16,000	ND
MA'AN - Feasibility Study	1986	14,000	ND
AJLOUN-ANJARA-EIN JANNAH - Feasibility Study	1986	18,000	ND
MAFRAQ - Feasibility Study	1986	27,000	ND
RAMTHA - Feasibility Study	1986	35,000	ND
WADI SEER - To be Designed (1/2 with Amman)	1985	14,000	ND
BAQA'A CAMP (Temporary)	1985	50,000	ND
BAQA'A CAMP - Permanent	1985	56,000	ND

¹ AS-Activated Sludge OP-Oxidation Pond EA-Extended Aeration
RF-Roughing Filter TF-Trickling Filter ND-Not Defined

² Number not available

³ Information available as of November 1981

⁴ Construction to start late 1983

Table 3. Year of Start-up and Population Served by Water Treatment Plants in Jordan.²

Water Supply Systems	Start-Up	Population Served (Estimated)
AMMAN/AZRAQ	1980	701,000
AMMAN - Well System - (Existing)	1981	701,000
AMMAN - From East Ghor Main Canal	1984	1,000,000
QA' DISI-AQABA ¹	1981	32,000

¹ Deep well supply of high quality

² Information available as of November 1981

WSC operates the water distribution systems in some cities directly, such as in Aqaba and Madaba, and is going to take over the water supply distribution of all other cities in the near future. WSC is supposed to take over all the water supply and sewerage projects operated by other special agencies, except AWSA and by JVA, by 1985. The wastewater treatment plants under construction and study listed in Table 2 will be operated by WSC after completion. A new project under consideration is that of Disi/Aquaba.

4.1.3 Jordan Valley Authority (JVA)

The JVA is responsible for the management of water resources in the Jordan Valley (up to 500 meters above sea level) and for water supply for domestic and irrigation uses throughout the region including planning, design, construction, operation and maintenance projects, for wells, pumping stations, reservoirs, water delivery systems, and also surface and subsurface drainage works. JVA is responsible for the construction of the new water supply system for Amman from the East Ghor Main Canal which includes a treatment plant, pumping stations and pressurized lines.

4.1.4 Ministry of Municipal and Rural Affairs, Environment (MMRAE)

The MMRAE, through its Department of Services and Engineering, oversees contracts and supervises construction for water supply projects only, but does not operate or maintain these facilities. After completion of construction, the systems are, or will be, transferred to WSC. The MMRAE staff in the water sector is a very small one and includes only three specialized engineers.

4.1.5 Natural Resources Authority (NRA)

The NRA, among other responsibilities, is in charge of much of the preliminary work concerned with the development of water resources. These efforts are carried out by engineers, geologists and other professionals. These professionals are supported by the Department of Mechanics and Transport for their field investigations.

The Department of Mechanics and Transport, is responsible for operating and maintaining 190 vehicles, water pumps, generating sets, welding machines, drilling and other heavy equipment. NRA provides support of mechanical equipment to other entities in the water sector.

The present staff is 220, most of them drivers (120) and support staff. The technical staff includes two mechanical engineers, 35 Mechanics and other skilled workers. The Department is under staffed, and a short-term training program is required.

4.2 Planned Facilities

During the last few years the Government of Jordan has planned for rapid expansion of its wastewater treatment capability as shown in Table 2. This expansion is the major reason for the need for training as the Government does not have existing personnel with operational, maintenance and process control experience in wastewater treatment.

In addition to the new wastewater treatment facilities, several water supply schemes are coming on-line as indicated in Table 3. The proposed East Ghor Main Canal supply will include the first full-scale water treatment plant in Jordan.

4.3 Existing Personnel Training Needs

Table 4 indicates present, future and total personnel needs for the major organizations providing water sector services in Jordan. As indicated in Chapter 1, the grand total is expected to exceed 4,000 by 1987. Large numbers of these personnel will need training to enable them to continue in their current positions which in the future will require additional skills. In addition, as new facilities come on-line or existing facilities are expanded many of these persons will need training.

4.3.1 Present Manpower Capability and Training Needs

Personnel in the above organizations can be classified as follows:

- Top management
- Middle management
- Supervisory
- Technical Staff
- Clerk and administrative staff
- Craftsmen and skilled and semi-skilled workers
- Laborers

Table 4. Estimated Personnel Needs by Position Category for Selected Water Sector Organizations*

ORGANIZATIONS																					
ENTITIES' PRESENT AND NEEDED STAFF	AWSA ¹			NRA ²			JVA ³			WSC ⁴			Irbid ⁵			Zarqa-Ruseifa ⁶			TOTAL		
	P	N	T	P	N	T	P	N	T	P	N	T	P	N	T	P	N	T	P	N	T
CATEGORIES (GROUPS)																					
I-Top & Middle Mgt.	21	2	23		3	3							4	6	10		2	2	25	13	38
II-Clerk & Adm. Skills Staff	74		74				7	7	534	5	539	27		27		14	14	635	26	661	
III-Financial & Collecting	62		62									17		17		43	43	79	43	122	
IV-Supervisory	36	17	53	7		7			23	2	25	7		7		9	9	73	28	101	
V-Technical & Prof.																					
Engineers (Misc)									5		5							5	0	5	
Engineers (Civil & San.)	16		16	3	3	6	4	4	14	1	15	5	1	6		4	4	38	13	51	
(Mechanical)				2	1	3	1	1	17		17							19	2	21	
(Electrical)							2	2	5		5							5	2	7	
Chemists	3		3		3	3	3	3		3	3			1	1			3	10	13	
Hydrologists				3	2	5												3	2	5	
Geologists				2	1	3												2	1	3	
Others	16		16		14	14												16	14	30	
VI-Craftsmen & Skilled Workers																					
Operators									262		262							262		262	
Operators - Water T.P.							9	9											9	9	
- Sewage T.P.	6	22	28										16	16				6	38	44	
- Pumping				5	10	15												5	10	15	
- Chlorination	15		15													1	1	15	1	16	
- Disb. Systems												3		3				3		3	
Mechanics (Maintenance)	49		49	20	3	23	3	3	55	2	57	6		6		5	5	130	13	143	
Electricians ()	37	6	43	5		5			17	2	19	2		2		3	3	61	11	72	
Well Drillers				13	11	24												13	11	24	
Welders	6		6	4	6	10										1	1	10	7	17	
Meter Readers	35		35									20		20		14	14	55	14	69	
Meter Repairmen	3		3									4		4		6	6	7	6	13	
Lab. Technicians	3	6	9				4	4		3	3	1		1				4	13	17	
Draftsmen	17		17									2		2		1	1	19	1	20	
Surveyors	20		20													1	1	20	1	21	
Plumbers & Pipefitters	36		36						70		70					22	22	106	22	128	
Assistants & Helpers	21	4	25	14	10	24				6	6	4	4	8		13	13	39	37	76	
Others	56		56	1	14	15	8	8	11		11							68	22	90	
VII-General																					
Drivers	90		90	120	17	137	4	4	192	4	196	21		21		8	8	423	33	456	
Guards, Watchmen	54		54	10		10	3	3		2	2	2		2		20	20	66	25	91	
Laborers	234	85	319	20	40	60	4	4		12	12	8		8		21	21	262	162	424	
Others	20		20	11		11	10	10								5	5	31	15	46	
TOTAL	930	142	1072	240	138	378	62	62	1205	42	1247	133	28	161		193	193	2508	605	3113	
Legend:	P - Present			¹ See Ref. 4			² Information supplied by NRA			³ Information supplied by JVC and Ref. 7			⁴ Information supplied by WSC			⁵ See Ref. 8			⁶ See Ref. 6		
	N - Need by end of 1982																				
	T - Total																				

*The Latest estimates should be obtained from each agency before use is made of these numbers. This table reflects information as of November 1981.

The demand for well-trained personnel, at all levels, is great and will be increasing in the future. In general, each of these groups may be described as indicated below.

Top and Middle Management and Technical Staff

These groups in Jordan are technically well prepared and capable. Most of them hold university degrees and may have post-graduate degrees in specialized academic courses from universities abroad.

Two major areas of training need to be included in upgrading the skills of top and middle level management personnel. The first is in the area of management skills. The traditional engineering programs that these persons have been exposed to do not include this material. Topics needed include:

- Delegation of authority
- Developing work schedules
- Communication techniques
- Emergency and disaster planning
- Decision making
- Providing feed back
- Stores control

Appendix J has a more complete listing.

The second area of need is in treatment process control. Most of the proposed sewage treatment facilities utilize process control techniques that are completely new to Jordan. Thus considerable training and opportunity to obtain on-the-job experience will be required for the new technical staff.

Supervisory Staff

This group needs technical training that can be provided locally by VTC, Jordan Institute of Public Administration (JIPA), the community colleges and/or Polytechnic. The remaining problem to be solved by external assistance is related to specific training directed at administrative and managerial skills, such as work planning, manpower supervision, and training, as well as training in process control.

Clerks and Administrative Staff

These groups, as well as other regular categories of semi-skilled workers, can be recruited from the organizations preparing them for careers, but they usually need some additional training. They include typists, cashiers, etc.

Craftsmen, Skilled and Semi-Skilled Workers

These workers constitute the largest group needing specialized training. Many functions which they perform are essential for operation and maintenance of water sector facilities.

Their job titles are very specific and include:

- Operators of Water and Sewage Treatment Plants
- Operators of Pumping Stations
- Maintenance Mechanics
- Maintenance Electricians
- Equipment Operators
- Plumbers and Pipe-Fitters
- Chlorination Operators
- Well Drillers
- Laboratory Technicians
- Water Meter Readers and Repairmen
- Leak Detection Staff
- Drivers
- Carpenters
- Painters

From their ranks come the future instructors, foremen and supervisors. There is a need in Jordan for immediate training of personnel in these categories. Training projects must be designed to attain established objectives in terms of improved performance on actual tasks.

Training for these categories and the laborers can be provided on the job or by local institutions such as the VTC, the community colleges and the Polytechnic. Collaborating with these

organizations, which are already equipped to carry out this type of training will greatly facilitate the production of qualified manpower.

4.3.2 Anticipated Manpower Requirements

While a number of institutions and organizations have been unable to provide specific data, in-person interviews have been conducted with the management of all potential employers of personnel in the water sector. Through these interviews a number of factors makes projections possible.

A nation-wide manpower inventory was carried out by NPC to identify available personnel. Although the report is not available at this time, preliminary results indicate that there are about 2,500 persons presently working in the water sector. This figure is expected to rise to some 4,000 by 1987.

At present there are three sewage treatment plants in operation but staffed with personnel with limited training. They have no back-up staff to step forward in the case of normal attrition. Within five years, there will be about 15 sewage treatment plants and major water supply and distribution systems. Thus it is all too apparent that a dire need exists for trained personnel at all levels in the water sector.

Another need for trained personnel will be for the operation of the treatment facilities required for industrial plants set up under standard 202.

As consultant reports are completed and organizational schemes are finalized, actual numbers must be produced. In light of the high losses of personnel due to other opportunities, the projection of specific staff needs must be amplified in order to handle these high turnover rates.

Chapter 5

EDUCATION AND TRAINING ORGANIZATIONS

5.1 Introduction

As needs have developed, various agencies, authorities, institutions, and other entities have tried in their own way to address the demand for more and better-trained personnel. This has resulted in a broad spectrum of skills, facilities, and programs for the training of personnel in the water and sewerage area.

5.2 Academic Institutions

The Universities of Jordan and Yarmouk both offer baccalaureate degrees in civil engineering. Neither institution is currently including more than one or two courses in sanitary engineering systems, methods or design. Both appear anxious to contribute their resources and talents to this vital area of need. In addition, the University of Jordan is also developing a general two-year technician program (in cooperation with three other colleges on campus) that allows for some specialization.

The Amman Polytechnic Institute provides training in the trades, one-year certificate programs for craftsmen with heavy workshop components, and two-year diploma programs for technicians emphasizing laboratory exercises. A two-year Water and Sewerage Technician Program is planned beginning this year (1982) although at this time the curriculum has not yet been finalized or approved by the Ministry of Education. Thirty students are expected to enroll in this program.

There are 40 community colleges in Jordan, half of which are privately owned. Of the remaining 20, only 11 are under the authority (jurisdiction) of the Ministry of Education. This means that the standards and thus the quality of graduates of only 11 out of the 40 programs is under control of the Ministry of Education. The other 29 programs can develop and implement programs and turn out graduates of any quality they want. Thus any standardization of program content for trainees in water sector programs could only be assured in 11 of the 40 programs (if all chose to implement such programs). In any of the 29 programs not under control of the Ministry of Health, that decided to implement water sector training programs an attempt would have to be made to convince the implementing institution to abide by some agreed upon standards or to get agreement from potential employers of program graduates to only nine persons from certified programs.

There are no apparent efforts underway to provide technicians specifically for the field of water and sewerage. Many colleges, however, with two-year engineering technician programs do offer courses that might be of value to the water sector.

5.3 Agency and Authority Training Systems

The Vocational Training Corporation (VTC) is an independent training agency that operates at five levels: professional, technician, craftsman, skilled labor, and limited skilled labor. VTC is actively involved in programs for the craftsmen and skilled labor, leaving the professional and technician training mostly to other institutions. There is a heavy emphasis on on-the-job-training (OJT) supplemented with more formal instruction. VTC's expertise in developing and implementing training should be tapped by the water sector. Technical expertise from water sector organizations combined with the training expertise of VTC would provide a quick and effective mechanism to provide AWSA, JVA, NRC, and WSC with trained personnel. It is unfortunate that the water sector has not tapped this resource as yet.

The Amman Water and Sewerage Authority (AWSA) has received funding, built a training facility, established a training group, and sent personnel abroad for training-of-trainers preparation. To date, some limited training activity has begun.

The Water Supply Corporation (WSC) is soon to be responsible for both water and sewerage systems outside of Amman. It has of late been considering sending some key personnel abroad to learn training techniques in addition to the personnel that have been receiving technical training. Limited training is being conducted.

The Jordan Valley Authority (JVA) trains its personnel more on a one-on-one basis relying heavily on OJT. JVA also sends personnel abroad for specialized instruction and is committed to improving the level of trained personnel.

The Jordan Institute of Public Administration (JIPA) is located at the University of Jordan but is totally independent. It has its own budget and sets its own policies. JIPA provides management training for both public and private organizations either at the client's facility or at other institutions. It also conducts training-of-trainers workshops.

5.4 Facilities and Materials

The universities, Polytechnic and community colleges (those visited) have remarkably complete laboratories, libraries, classrooms and offices. For those disciplines being taught,

the facilities are more than adequate. While expansion into the field of water and sewerage will require facilities and equipment not available at the present time, this additional requirement will be quite modest, since some equipment has already been ordered.

Some Government organizations either have training facilities or plan to acquire them in the near future. The AWSA Training Center has been built and equipped. The JVA is currently designing a maintenance workshop for the purpose of training maintenance mechanics. VTC has 14 training centers under construction at the present, with eight more planned for completion by 1985.

Independent organizations like the Jordan Institute of Public Administration also have facilities for training.

Chapter 6

PROJECT OBJECTIVES

6.1 Project Goals

The overall goal of this project is to establish and implement a Jordanian operated training system for the water sector--a system which will ensure that trained personnel are available to manage, operate and maintain all associated facilities and equipment. To achieve this, immediate and long-term objectives must be met.

Based on the interviews, visits and review of reports and documents by the team, a proposed set of project objectives were developed in consultation with Government officials. These objectives were developed specifically to make use of Jordanian organizations and personnel as much as possible.

6.2 Project Objectives

The immediate objectives are to:

1. Conduct training courses described herein and others yet to be identified.
2. Establish an on-going system for managing water sector training.
3. Assist staff at Jordanian training facilities with the development and implementation of water sector training programs.
4. Continue the identification of training needs (beyond those identified herein).
5. Design and assist water sector organizations with study tours and assignments of Jordanian personnel in work-study programs in institutions and facilities in other countries and integrate these activities into the training system.

During the implementation of the project a number of long-term objectives will be achieved. These will include:

1. The development of a system for determining long-term human resource and training needs.
2. The coordination of activities of Jordanian training organizations to meet the needs of the water sector.

3. The development of procedures for evaluating management, operation and maintenance of water facilities and methods of addressing problems.

6.3 Organizational Development Needs

in order for the existing 15 organizations involved in water sector activities, or with potential to make contributions to these activities, to accomplish the above goals and objectives, it will be necessary for them to take a serious look at the present organizational structure of each organization and even more critically to look at their present and potential propensity to collaborate in training activities. If each organization continues its present independent course of action, there will be much duplication of effort, establishment of redundant training facilities and training carried out of lower quality than might be accomplished with collaboration. The approach that is outlined in the following chapters is one that is based on the information available to the teams during and subsequent to their visit in November 1981. It must be kept in mind that implementation of the various suggestions in this plan must take into account the changing circumstance in the cooperating organizations.

Because there is not one organization in Jordan at the present time that can bring together all the necessary aspects, it is proposed to create a temporary one to assist the Government in meeting its immediate needs as well as assist in the long term organizational development needs. The key factors generally accepted as critical ingredients for organizational change appear to be present.

They are*:

1. Pressure for change: Evidence of significant pressure for change both within each organization and also in the external environment (including between the organizations).
2. Intervention at the top: Key persons at the top of the organization(s) who are committed and who will provide leadership in taking a searching look at the organization and its needs.
3. Diagnosis and participation: Evidence of active participation of several management levels in diagnosis of problem areas and improvement of planning.

* Abramson and Halset, 1980. Planning for Improved Enterprise Performance, ILO, Geneva.

4. Invention of new solutions: Evidence of willingness to try new ideas, methods and solutions to problems.
5. Experimentations with new solutions: Evidence of willingness to take risks and experiment with new solutions in a search for results tested on a small scale at first.
6. Reinforcement from positive results: There must be monitoring, review and positive reinforcement over a long-term period in order to make short-term improvement permanent and to ensure the spread of the change effort.

With these ingredients present then, the Government is ready to move ahead. An excellent way to move ahead with this organizational development process is to follow a systematic process, such as the one laid out in "Planning for Improved Enterprise Performance" by Robert Abramson and Walter Halset, and published by ILO, Geneva. Application of the steps in this process will assist the implementors of the proposed plan in the following chapters to adopt and perfect it for Jordanian circumstances.

Chapter 7

TRAINING PHILOSOPHY

The training activities will be designed to improve the quality of work performance rather than the depth of theoretical knowledge. Experiential learning techniques will be emphasized.

Experiential learning is a process by which a trainee gains knowledge and skills through participation in activities and subsequent reflection or analysis. It is an approach to training that de-emphasizes academic lectures and focusses on practicing the skills needed to do the job.

To satisfactorily complete a lesson the trainee must demonstrate, where practicable, all the knowledge and skills required for on-the-job performance, at a predetermined level of proficiency. This requires that clear and concise training objectives, based on actual tasks, be made known to both trainers and trainees. These serve the purpose of both motivating trainees and providing a standard for measuring the trainee's progress and quality of performance.

This approach dictates certain steps and procedures that must be used, such as conducting training needs assessments, selecting and determining the capabilities of those trainees who participate in developing performance objectives, selecting appropriate sites, monitoring and evaluating the training program.

Training must be viewed as a continuous process, with training provided not only for new entries but also for those on the job in various types of in-service programs. Continuous monitoring of employee performance will reveal the needs for additional in-service training.

This training philosophy is not new to Jordan. It is already being used by the Vocational Training Corporation and the Jordan Institute of Public Administration in programs for other sectors.

With the rapid expansion of water sector facilities in Jordan, it will not always be possible to provide the hands-on experience needed, since many of the facilities of the required type do not exist there. This means that some technical training must take place out of the country where the trainee can gain the experience required for his/her new assignment.

Chapter 8

STAFFING

The staff required to conduct this project is composed of three groups: project staff, seconded Jordanian staff, and outside specialists (see Figure 1). A project board of advisors is suggested to oversee and coordinate activities with the various organizations. See Chapter 9 for details.

It is suggested that the full-time project staff be housed in the Water Supply Corporation. The WSC will have the largest number of employees in sector work since they will have responsibility for the operation, maintenance and administration of most of the facilities under design and construction. In addition, facilities currently under the administrative control of municipalities are slowly being placed under WSC management. These full-time staff are noted in Figure 1.

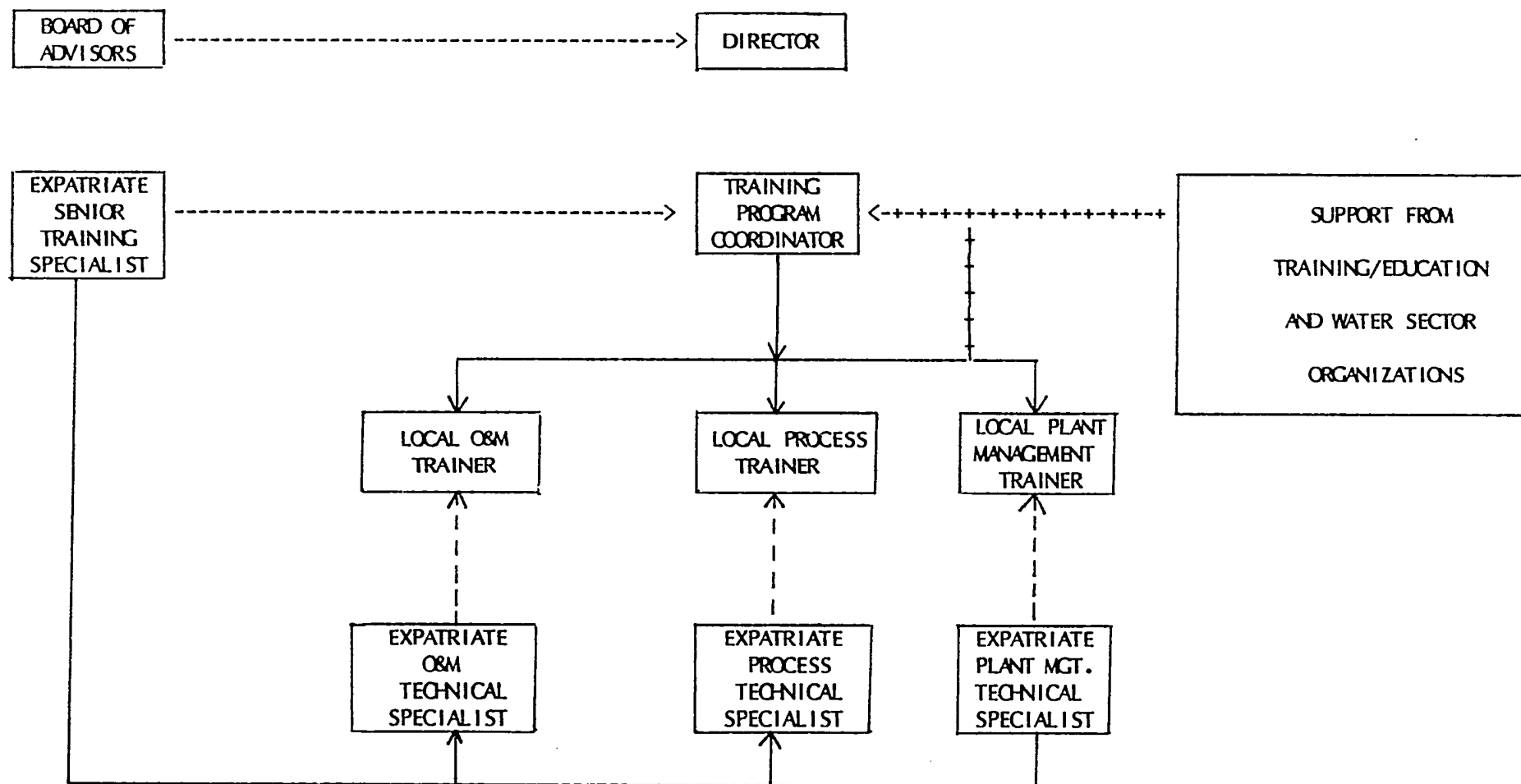
In order to draw upon the experience of other sector organizations, as well as the training/education organizations in Jordan, provisions are made for personnel from these organizations to assist with project activities. These persons should be seconded to WSC during their assignment with the project. These persons are noted in the large box on the right in Figure 1.

The third group assisting with project implementation is the expatriate specialists. Figure 1 indicates the relationship of these three groups. These expatriate specialists are noted in Figure 1.

8.1 WSC Project Staff

The Project staff is composed of Jordanians who are responsible for the conduct of the project including the coordination of inputs from the staff of advisors, Board of Advisors (see Chapter 9) and the cooperating organizations. The Project staff is also responsible for developing and implementing training programs; conducting needs assessments; arranging study tours and secondments; etc.

It is suggested that this staff be under the direction of the Water Supply Corporation (WSC). The staff should consist of a director, training program coordinator and administrative staff and should be able to communicate in English.



LEGEND:

- Lines of Authority in Project
- - - Advisory Support
- +--+ Technical and Training Support from Jordanian Organizations
- O&M Operations and Maintenance

Figure 1. Project Organization Chart.

8.1.1 Director

This position will be filled by an individual who is personally and professionally committed to the need for providing the water sector with trained personnel. A prime responsibility will be the direction of all aspects of the project and effectively communicating with the Board of Advisors, training/education organizations, water sector organizations, and expatriate specialists. This person will be well acquainted with the water sector in Jordan and will have established credibility with many of the water sector organizations. A model curriculum vitae of the candidate for this position is given in Appendix C.

8.1.2 Training Program Coordinator

This position will be filled by a person with extensive experience in training systems development and delivery. While reporting directly to the project director, this individual will have full responsibility for coordinating the design, development and implementation of needs assessments; training courses and programs; and evaluation systems. This individual will have academic credentials in education and at least five years experience in developing and implementing training programs. Qualifications will satisfy those currently required in Jordan in the vocational training sector. The curriculum vitae of the candidate for this position is given in Appendix D.

8.1.3 Operation and Maintenance, Process, and Management Trainers

These positions will be filled with Jordanian personnel who have technical experience in their respective subject matter areas and have been involved with training in an institutional setting. These individuals will provide the control for technical input and delivery of training in their areas of expertise. They will work directly with water sector personnel in the development and delivery of training. Model curricula vitae of candidates for these positions are provided in Appendix E.

It is anticipated that the candidates for these positions will require further expertise in their technical areas. Thus their initial assignment may be in an overseas organization to amplify their technical knowledge and skills. Development of their training skills will take place in Jordan.

8.2 Seconded Jordanian Staff

The project will draw upon available technical and training expertise as required for the implementation of project activities. Table 5 describes the organizations that have agreed to assist with design, development and implementation of project activities. They have also agreed to make training or plant facilities available where they are needed.

The credentials for the support personnel vary according to the type of technical expertise and how each individual is expected to contribute to the project. Functions of these personnel include:

- Task Analysis
- Training Materials Development
- Training of Trainers
- Water Treatment Operations
- Wastewater Treatment Operations
- Laboratory Analysis
- Process Control
- Administration

8.3 Expatriate Specialists

Because of the rapid expansion of facilities in the water sector, the large number of people soon to be required, and the need to upgrade the performance level of existing training personnel, it is essential to engage four well-qualified training experts to assist the Government of Jordan in establishing a viable training program in the water sector.

These include a full-time senior training specialist and part-time technical advisors in operations and maintenance, process control, and plant management.

8.3.1 Senior Training Specialist

This person will work full time with both the Project Director and the Training Program Coordinator in the planning, implementation, and coordination of project activities and day-to-day training activities. This person must have an extensive background in all aspects of training system development and implementation which should at least include the areas contained in the position description provided in Appendix F.

Table 5. Seconded Jordanians Available for Implementation of Project Activities.

Type of Organizations	Name of Organizations	Type of Assistance
Training Education	Community Colleges Systems JIPA JMI Ministry of Education Polytechnic Institute VTC	Task Analysis Instructional Material Development Graphics Management Training Supervision Training Training of Trainers Skills Training (Mechanical, Electrical, Office, Accounting).
Water Sector	AWSA JVA Ministry of Health MMRAE NPC NRA University of Jordan WSC Yarmouk University	Operations Maintenance Start-up Laboratory control Emergency Planning Process Control Administration Technical management

8.3.2 Technical Specialists

The operation and maintenance technical specialist, process technical specialist, and plant management specialist must be technically competent in their respective areas. They should have at least ten years practical experience plus two years training experience in their subject area with some training background. A position description is provided in Appendix G. The depth of experience and skill and knowledge requirements are reflected in the sample course descriptions provided in Appendix H.

8.3.3 Possible Additional Staffing

Apart from this project, the Government of Jordan has contracted with a number of organizations for the design and construction of water sector facilities. Tables 2 and 3 summarize these major activities, most of which have training components technical advisory staff. These projects include training for plant start-up, operation, maintenance, troubleshooting procedures, laboratory, and process control. Every effort will be made to coordinate these training activities with those of this project.

Considerable planning for the human resource needs of the new facilities has taken place. These plans are contained in the various consultant reports prepared for the Government. JMM/DMJM in their December 1980 report "Preliminary Study and Master Plan for Wastewater Disposal--Greater Amman Area" has reviewed existing personnel and operation and maintenance policies, present staffing, and personnel qualifications and suggested training program needs.

The report by Stanley Consultants, Inc. and Boyle Engineering Corporation prepared in April 1980 entitled "JVA Domestic Water Project--North Jordan, Southern Region" contains suggested job qualifications, including education, experience and responsibilities for engineers, operators, chemists, technicians, superintendents and storekeepers. In addition, suggested training programs are included.

The Weston International, Inc. report for "Irbid Municipal Water Distribution, Sewerage and Solid Wastes Disposal Project" prepared in March 1980 contains information on the personnel needs for the organization, institutional arrangements and training plan. The training plan suggests both overseas and in-country training needs.

The Malcolm Pirnie, Inc. Report for the "Zarqa-Ruseifa Water Distribution, Sewerage and Stormwater Systems" prepared in 1980 describes a training program which includes selection procedures for trainees, overseas training needs and future training needs.

The AID project papers relating to the above projects have stressed the needs for training in the hands-on operation of equipment and facilities as well as in the administration and management functions of the facilities.

From the above it is apparent that considerable effort has been expended in the training area already. The proposed plan laid out here should build on these efforts and coordinate expertise and funds in a unified approach.

Chapter 9

PROJECT BOARD OF ADVISORS

A project Board of Advisors will be established at the beginning of the project to assist the project staff in planning as well as in communicating with education/training and water sector organizations in the country. The Board will meet with the Project Director and staff on a periodic basis. The Board should be composed of representatives from the following organizations:

- Amman Water and Sewerage Authority
- Jordan Institute of Public Administration
- Jordan Valley Authority
- National Planning Council
- National Resources Authority
- Polytechnic Institute
- University of Jordan
- Vocational Training Corporation
- Water Supply Corporation
- Yarmouk University
- Each donor organization supporting this project.

The Board of Advisors will be chaired by a representative from one of the Jordanian organizations. It will meet quarterly to review project activities and it will also meet with the evaluation team when so requested by the team. As required, the Board will meet with donor representatives.

Functions of the Board members will include:

- the promotion of project concepts of training within their respective organizations as well as other organizations and activities associated with the water sector
- review and support of project activities as developed and approved by the Project Director, project staff, donors and the Board
- approval of work plans developed by the project
- assisting the Project Director with establishing priorities
- supporting long-term guidelines dealing with training philosophy, personnel policies, training policies, etc.
- examining new proposals for continued project financing

- review procedures and progress of the project manager in accomplishing project goals
- review and verify project finances and budgets
- promotion of the relationship of project staff with overseas organizations

Chapter 10

WORK PLAN

It is proposed that a three-phased five-year work plan be implemented as soon as personnel can be mobilized. The first phase will satisfy immediate training needs as well as provide a basis for the subsequent project activities. This phase is dependent on outside consulting assistance. The second phase is a continuation of the first but with considerably less input from outside consultants. The third phase includes follow-up and evaluation and upgrading of programs and personnel capabilities with minimal assistance from outside specialists.

10.1 Phase One - First 18 Months

10.1.1 Overall Program

Based on the results of personal interviews and on-site inspections at several installations, it is recommended that training activities be initiated immediately. It is suggested that priorities be established and planning begin for courses on the following subjects:

- Chlorination
- Pumping and Piping
- Electric Power
- Daily Operational Control
- Emergency Procedures
- Primary Sedimentation
- Aeration
- Secondary Sedimentation
- First Stage Digestion

Courses on chlorination, pumping, and piping and electrical power are needed by AWSA, JVA and WSC. These courses would be given to operational and maintenance personnel. The courses on maintaining daily operational control and emergencies would be required for all managers, superintendents and shift foremen. Variations of the course content would have to be prepared for each of the above organizations. The courses on primary sedimentation, aeration, secondary sedimentation and digestion are specifically intended for the personnel at the Ain

Ghazal plant. After more detailed studies of the plants at Salt, Jerash and King Hussein Medical Center, specific courses could be recommended. In addition, they will also be used for the new wastewater plants as they come on line.

Appendix H includes brief descriptions of some course objectives and content for each of the subject areas. This information will need to be developed for each module containing: a list of objectives and directions for instructors and trainees, the necessary training conditions, and the level of performance to be attained by the trainee. In addition, activities are to be included for both the instructor and trainee. The objectives should be subdivided into small segments of knowledge and/or skills for the development of a course for a particular set of needs. It should be noted that these course descriptions have been prepared for a performance-oriented approach to training as is described in Chapter 7. The descriptions have been generalized by subject matter. Certain modifications will be necessary depending on the particular capability of the trainees and their respective assignments. This is usually done at the time a specific course is prepared.

Along with the implementation of the above courses, the project staff would also develop and implement procedures for collecting data and estimating human resource needs in the water sector. This would include not only the numbers and types of personnel needed but also related information regarding turnover rates. Procedures for conducting task analyses would be developed and the task analyses initiated. This would provide information for setting priorities and objectives for future training exercises (e.g. institutional, workshop, study tours, overseas work-study, etc.). These task analyses would also form a basis for position descriptions and personnel/training policies.

Additional activities of the staff could include the collecting of training resources for the water sector, contacting organizations overseas to establish locations for institutional study, study tours and overseas work-study programs.

By the end of the first year the staff will have developed procedures for training line supervisors and foremen in transferring skills/knowledge to workers they supervise. For preparing instructional materials and for evaluating training.

A suggested schedule of project activities is given in Figure 2. Person month estimates are shown with budget figures in Table 7 page 49.

As indicated, the use of training and educational facilities in Jordan will be used as much as possible. The VTC has well developed capability to assist the water sector in carrying out needs assessments, training trainers and providing training in many basic skills in electrical and mechanical

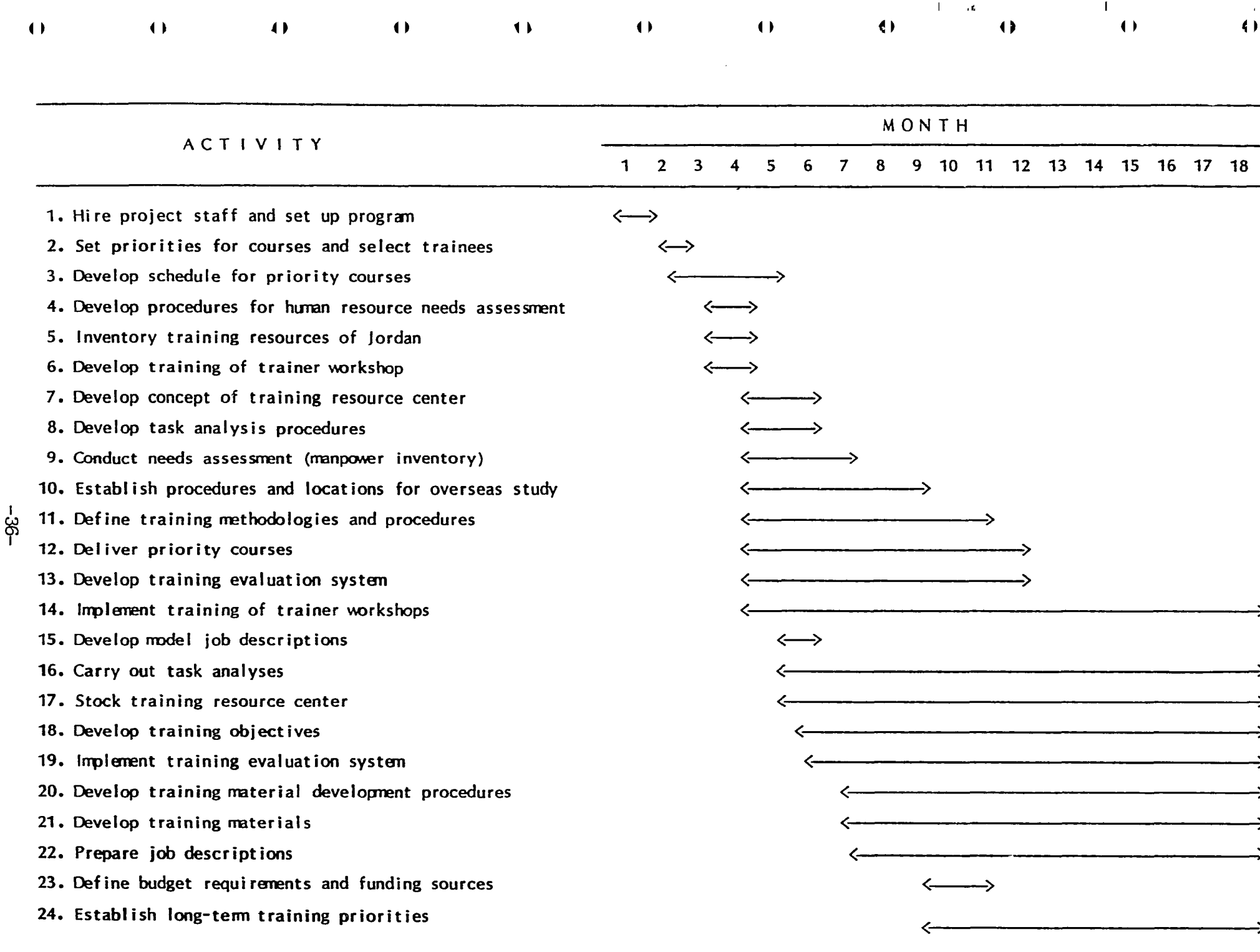


Figure 2. Project Activities for First 18 Months.

operations and maintenance procedures. Their success with other governmental agencies as well as the private sector attest to this. One major aspect of this first phase of this effort will be to assist these various water sector organizations in their collaboration with VTC. A good place to start is in the training of technicians in electrical and mechanical equipment maintenance. In addition, they will provide training for AWSA, JVA, NRA and WSC personnel on the techniques of on-the-job training. Training materials and programs developed by the Vocational Training Corporation (VTC) and the project staff* will be made available to the community colleges and Polytechnic for use in their programs. In this way, graduates of these programs will be better prepared for work in the water sector.

The information generated in this project will provide useful information for the university programs in the development of the engineers, scientists and administrators for the water sector. However, this will not be felt for sometime as graduates of these university programs will not be available until late in the project. However, the universities can make contributions by providing assistance in the solutions to problems as they arise in training system development or plant start-up. On occasion, research may be necessary to solve process control problems. In these cases, students under the direction of a professor or a professional engineer or scientist could assist the facility.

The Jordan Institute for Public Administration (JIPA) and Jordan Management Institute (JMI) will be used for basic training in administrative, management and financial matters. Provision is made for study tours for personnel to observe first hand the application of administrative, management and financial matters in facilities similar to the ones to which they are assigned. Personnel selected for study tours will meet language requirements for the country to which they are sent. Standard testing procedures will be used to verify language capability. Where candidates for study tours do not have the language requirements the Government will supply this training before the person is sent.

As indicated in Figure 2, the setting of priorities for training is an early task. This is very important for the WSC as they assume responsibility for the existing municipal systems.

* Project staff includes all persons engaged in any aspect of the proposed training effort.

The employees of these systems will need upgrading in their knowledge and skills. Thus an early effort must be made in developing the task analyses for these workers and evaluating their performance against the standards set.

Another point to consider in setting training priorities for the operation of new facilities is the need to have personnel begin their training prior to start-up. Provisions for this type of planning are built into project activities delineated in Figure 2. This means close collaboration with each of the projects indicated in Tables 2 and 3 and planning for the training at a time coordinated with construction and start-up schedules.

During this early phase overseas study, study tours and overseas work-study will be included to increase the pool of qualified training personnel. Suggested study tours are shown in Table 6. As much training as possible will be conducted in Jordan. Each person with overseas training will receive a specific assignment on return to Jordan as an integral part of the on-going learning process. It is important to establish clear objectives for each of these study tours, so that each person, on returning, can fit into a prescribed training role.

10.1.2 Activities for Phase One

1. Hire Project Staff and Set Up Program

This includes the logistics necessary to set up an office and the actual identification and hiring of full-time project staff. The logistics will involve such areas as buying furniture, renting an office, and buying office supplies.

2. Set Priorities for Courses and Select Trainers

Decisions will have to be made as to which courses should be organized and delivered first. This will be based on determination of immediate needs. Information made available to the team indicated the following priorities as of November 1981:

- o Chlorination
- o Pumping and piping
- o Electric power
- o Daily operational control
- o Emergency procedures
- o Primary sedimentation
- o Aeration
- o Secondary sedimentation
- o First stage digestion

Table 6. Suggested Study Tours

J O B T I T L E	T Y P E O F S T U D Y T O U R A B R O A D	I N I T I A T E D B Y	P E R S O N M O N T H S	U . S . \$ C O S T S
Project Director	Professional Meetings on Human Resource Development in Water Sector	As available	1	4,400
Training Program Coordinator	Assignment with Water Sector Training Organization	Month 1	1	4,400
	Assignment with Professional Training Organization	Month 10-15	0.5	2,200
	Attendance at Professional Training Meeting	Month 10-15	0.5	2,200
Operation and Mainte- ance Trainer Specialist	Assignment with Water Sector Training Organization	Month 1-2	2	8,800
Process Trainer Specialist	Assignment with Water Sector Training Organization	Month 6-8	2	8,800
Plant Management Specialist	Assignment with Water Sector Training Organization	Month 10-11	1	4,400
			T O T A L	35,200

Selection of trainers should be based on such criteria as financial concerns, location of training, attitude toward new job duties, prior background, interest of participants, and needs for skilled personnel in a given area.

3. Develop Schedule for Priority Courses

This will involve drafting course curricula for the priority courses. These courses will be based primarily on pre-existing courses which are easily adapted to the Jordanian needs and not on courses which will need long-term development.

4. Develop Procedures for Human Resource Needs Assessment

In order to address long-term human resource needs in the water sector, procedures must be developed. These procedures are likely to include setting up systems to periodically review personnel needs and performance to determine training needs.

5. Inventory Training Resources of Jordan

An inventory should be done of all the training resources, both human and physical, for use by the project staff. To the extent possible, the project will use existing Jordanian resources rather than relying on external sources. The inventory will lead to the selection of sites for training including the university, community colleges, VTC, Polytechnic and plants. Several of the types of proposed facilities listed in Tables 2 and 3 do not presently exist in Jordan. Thus hands-on training prior to start-up must be done outside of Jordan.

6. Develop Training of Trainer Workshop

In order to provide Jordanian technical personnel with training skills, workshops will be developed. These workshops will be based on an assessment of the training skills that will be needed and will cover such areas as task analysis, needs assessment, writing objectives, designing performance based training sessions, trainer styles, trainer delivery skills, and evaluation.

7. Develop Concept of Training Resource Center

A training resource center would consist of readily accessible training materials, documents, and aids. Relevant manuals as well as any visual aids such as slides or films would be in-

cluded. Developing the concept of the resource center would involve detailing the kinds of materials needed and procedures for organizing them so they are retrievable.

8. Develop Task Analysis Procedures

A task analysis is a detailed list of all the functions that a specific job entails. It is an essential step to determine exactly what training should focus on. Before doing a task analysis, procedures should be developed to decide who will do the task analysis, what the format is, what questions should be asked to elicit the information, and who should be interviewed to gather data on the task.

9. Conduct Needs Assessment (manpower inventory)

This is the carrying out of the needs assessment, using the procedures developed previously.

10. Establish Procedures and Locations for Overseas Study

After a determination of exactly what training must be done overseas, procedures for selecting participants and locations must be established. Participants should be selected on the basis of pre-determined criteria which take into account factors such as need, job performance, and long-term payoff.

11. Define Training Methodology and Procedures

Although the training approach is performance based and participatory in nature, the methodology will need further definition. The types of activities to be used must be clarified since it will have a direct influence on the training materials which are selected and developed.

12. Deliver Courses

This is the actual instruction of the courses. Courses will involve a mixture of classroom and on-the-job training.

13. Develop Training Evaluation System

A monitoring and evaluation system must be fully developed and linked to the other components of the training system. Monitoring consists of regular review of progress toward objectives through such activities as staff meetings, examinations

(both theoretical and practical), and trainee review. Timelines and commitments must be established for effective monitoring and evaluation to take place.

14. Implement Training of Trainer Workshops

An on-going series of 1-2 week workshops will be conducted to develop and improve training delivery skills based on procedures previously developed.

15. Develop Model Job Descriptions

The essential elements of all job descriptions must be defined.

16. Carry Out Task Analyses

Employees will be interviewed to develop a list of all of the specific tasks each performs. The frequency, the degree of difficulty and the importance of each task are assessed.

17. Stock Training Resource Center

The necessary supplies, materials and equipment for a training resource center will be ordered and purchased.

18. Implement Training Evaluation System

On-going monitoring and assessment of training programs, courses, instructor and trainees performance will be performed.

19. Develop Training Objectives

Training objectives based on the task analyses will be developed and form the basis of the actual curriculum.

20. Develop Training Material Development Procedures

A standardized approach to training material development will be agreed upon.

21. Develop Training Materials

Following the standard procedures, appropriate and practical training materials will be designed. These will be based on the training objectives previously developed.

22. Prepare Job Description

Following the model developed, specific job descriptions for each position will be prepared. These will be based on the detailed task analyses.

23. Define Budget Requirements and Funding Sources

Budget and funding requirements will be defined and funds will be identified and obtained for the next phase of the project.

24. Establish Long-Term Training Priorities

Project training needs for a five-year period will be determined and ranked on a list for decision makers.

10.1.3 Overseas Study Tours

A list of suggested subject areas for possible study programs, study tours overseas and work-study tours is presented in Appendix I.

Selecting candidates for participation and location of training would be based on a combination of the following factors:

- Numbers of persons needing such a program, tour or work-study abroad and their availability.
- Urgency of the need for this new knowledge or skill in Jordan.
- Availability (at time of decision or the near future) of such a program in Jordan.
- Qualifications of candidates (e.g. language ability, personal desire, technical background in subject matter, learning aptitude, potential and commitment to serve as a trainer on return).
- Cost of overseas program versus cost of importing the talent to conduct the training in Jordan.
- Need for developing skill on particular types of equipment or facility.

The selection of institutions, installations and countries for these efforts would be based on the quality of the program offered and how closely it can satisfy the training objectives of each candidate being considered for such a program.

10.1.4 A Preparation for Phase Two

At the end of 12 months, a detailed budget will be prepared for Phase Two (second 18 months) activities.

During the first 18 months of the project, decisions will have been made regarding the size of full-time staff needed to manage project activities and the resources that the support organizations can contribute toward project activities. It is anticipated that the educational/training organizations, with assistance from project activities during the first 18 months, will be able to assume considerable responsibility for conducting training programs. Similarly, as the water sector organizations increase their expertise they can supply the needed technical inputs. Thus, at this time it is difficult to predict whether the inputs will come from project staff or support organizations.

10.2 Phase Two - Second 18 Months

Toward the end of the first year, a second 18-month work plan (Phase Two) will be developed and submitted for approval to the Board of Advisors and then to the Government and donor(s). Negotiations for budgets and outside assistance would have to be completed no later than six months prior to the end of phase one in order to ensure continuity of the project. It is anticipated that by this time project staff will be fully trained and able to carry out the planning, development, implementation and evaluation aspects of water sector training. Thus, the need for extensive outside assistance will appreciably diminish. During this period, two person months of training specialist time should be sufficient. These visits would take place at about the 24th month to assist with ongoing activities, the 30th month to assist with the development of the next two-year training plan, and the 36th month to assist with finalization and starting up the final phase of the project.

Four months of technical specialist time is allowed for assistance with specific training development activities based on the needs assessment and task analyses.

At the end of the first 30 months a final two-year work plan will be developed and submitted for approval to the Board of Advisors and then to the Government and donor(s). By this time the water sector training program will be organized with individual roles for the project staff and support organizations clearly defined.

10.3 Phase Three - Final Two Years

The emphasis during this phase is program refinement and the improvement of program, administrative and instructional skills. Evaluations and modifications will be conducted as a major activity even though this will be an ongoing activity. A detailed discussion of monitoring and evaluation is presented in the next section.

Significant technical input will be available during this period (as well as during earlier phases) from the consultants working on the many new facilities under construction (Table 2).

Overseas study, study tours and overseas work-study programs will continue in order to provide the water sector with a well-qualified pool of persons to draw upon.

Four months of training advisory time and four months of technical advisory time appear adequate to provide overall guidance and support.

Chapter 11

PROJECT MONITORING AND EVALUATION

For each of the activities delineated in Figure 2, monitoring procedures will be developed to ensure that each is accomplishing its objectives and on schedule. Quarterly reports will be made to the Board of Advisors. If circumstances prevent objectives and/or schedules from being met, revisions will be made and direction sought from the Board of Advisors. Any substantial variations, where necessary, will be referred to the appropriate funding agency. The preparation of new proposals for funding at the 12-month and 30-month periods also allows for revisions.

Monitoring activities will include, but not be limited to:

1. Progress reporting and review at routine staff meetings.
2. Progress reporting and review at periodic meetings of staff and Board of Advisors.
3. Periodic review of accomplishment of project objectives.
4. Visits to sites where trainees are working to monitor on-the-job application of knowledge and skill obtained in training.
5. Obtaining feedback from trainees and their peers, supervisors, managers as well as subordinates on the impact of training on their performance.

Major periodic evaluations have been built into the proposal in order to verify progress toward project goals as well as to suggest improved procedures or new tasks. These evaluations will take place as follows:

1. An evaluation will be done starting at the 10th month in order to assist with the preparation of the second 18 month portion of the project. A proposal will be drawn up after 12 months.
2. A similar evaluation will be carried out at the 30th month. Evaluation will be done before the proposal is prepared for the last two years of the project.
3. The final evaluation will take place at the 55th month in order to assess the extent to which the project has accomplished its objectives. In addition, this evaluation will generate suggestions for the Government on further training efforts in the water sector.

The person(s) selected to do this evaluation should not be previously associated with the project. He or she should have had considerable experience in training (at least equal to that of the position description in Appendix F) in the water sector. At least one month should be allocated for pre-evaluation of documentation, the evaluation, and a report.

Chapter 12

PROPOSED BUDGET

The proposed budget figures include a substantial initial amount of external input. As Jordanians gain more experience and more of them are trained for positions in the training system, the need for outside funds will diminish and Jordanian training, education, and water sector organizations will increasingly supply the technical and training expertise to carry out the project. Estimated budget requirements for this five-year plan are provided in Tables 7, 8, and 9.

The audio visual equipment will include overhead projectors, slide projectors, movie projectors and video tape players. Equipment will be placed at major training centers as well as at various other installations where and when training takes place.

Mechanical and electrical equipment cutaway models will be used in training troubleshooting procedures, as well as standard operation and maintenance procedures. Safety equipment used in these procedures will be included.

The real success of the proposed training efforts will be manifested in the ability of the personnel to control their treatment processes a great deal of the time. Thus the equipment used in the laboratory and field for process control must be available for training personnel. This includes both field monitoring equipment, (i.e., field test kits, DO meters, etc.) as well as the more sophisticated laboratory equipment for performing tests (incubators, ovens, spectrophotometers, respirometers, total organic carbon analyzers, infrared spectrophotometers, etc.).

The project will have to stock its library with existing training materials available from a host of sources around the world. The project will evaluate these materials for appropriateness to Jordan and have them translated in total or in part as appropriate. The same holds true for standard reference materials available in the water sector. Training aids of various types (such as those available from AWWA and WPCF) developed in other parts of the world should assist the project in quickly developing training programs without long waits for development of these items.

It is expected that the training organization will be established by the end of the first phase. Jordanian cost inputs are estimated as shown in Table 7. At this time it is difficult to estimate Jordanian costs in Phases 2 and 3. The training components in each organization should be established by this time. Estimates of these inputs can be made after definite commitments are made by each organization as to the number of personnel assigned to training efforts.

Table 7. Estimated Budget Requirements for First 18 Months of Project Implementation.

Category	Item	Jordanian Funding		External Funding	
		Person Months	US\$	Person Months	US\$
Personnel-					
Project Staff	Director	18	32,400		
	Training Program Coordinator	18	27,000		
	O&M Trainer	18	27,000		
	Process Trainer	18	21,600		
	Plant Management Trainer	18	21,600		
	Secretary/Typist	18	10,800		
	Total	108	140,400		
Seconded Staff	Task Analyzer	18	16,200		
	Training Material Developer	18	21,600		
	Management Specialist	9	10,800		
	Training of Trainer Specialist	9	10,800		
	Writer	18	16,200		
	Graphic Artist	18	16,200		
	Operator/Mechanic (Water)	18	16,200		
	Operator/Mechanic (Sewage)	18	16,200		
	Lab Specialist	6	7,200		
	Process Control Spec.	9	10,800		
	Administrator	9	10,800		
	Clerical, Graphic, etc.	36	21,600		
	Total	186	174,600		
	Expatriate Specialists	Senior Training Specialist			18
O&M Technical Specialist				6	60,000
Process Technical Specialist				10	100,000
Plant Management Technical Specialist				6	60,000
Evaluator				1	10,000
	Total			41	410,000
Project Management	Office Supplies				5,000
	Office Facilities		10,000		
	In-country Travel (vehicle & driver)				20,000
	Subsistence In-country Travel				5,000
	Telephone, telex, etc.				5,000
		10,000		35,000	
Training					
Equipment	Audiovisual				10,000
	Mechanical				10,000
	Electrical				10,000
	Process Control/Laboratory				20,000
Materials	Reference Materials				10,000
	Training Aids				5,000
	Translation Services		25,000		10,000
	Study Tours				35,200
				110,200	
	Total	294	350,000		555,200
	Contingencies 10%		35,000	41	55,520
	GRAND TOTAL	294	385,000	41	610,720

Table 8. Estimated External Budget Requirements for
Phase Two - Second 18 Months

Category	Item	External Funding	
		Person Months	US \$
Personnel Specialists	Senior Training Specialists	2.00	20,000
	OIM Technical Specialists	1.33	13,300
	Process Technical Specialists	1.33	13,300
	Plant Management Technical Specialists	1.34	13,400
	Evaluation	<u>1.00</u>	<u>10,000</u>
	SUBTOTAL	7.00	70,000
Project Management	Administrative Support Services		3,000
	Specialists Travel		
	Air Fare 8 @ \$2,000		16,000
	Per Diem 20 weeks		16,800
Training	Reference Materials		3,000
	Training Materials		12,000
	Training Equipment		6,000
	Overseas Study, Study Tours and Work Study Tours 4,400 per month	<u>20</u>	<u>88,000</u>
	SUBTOTAL	<u>20</u>	<u>144,800</u>
	TOTAL	27	214,800
	Inflation 20%	--	42,960
		====	=====
	GRAND TOTAL	27	257,760

Table 9: Estimated External Budget Requirements
for Phase Three - Final Two Years

Category	Item	External Funding	
		Person Months	US \$
Personnel Specialists	Senior Training Specialists	4.00	40,000
	OIM Technical Specialists	1.33	13,300
	Process Technical Specialists	1.33	13,300
	Plant Management Technical Specialists	1.34	13,400
	Evaluation	<u>1.00</u>	<u>10,000</u>
	SUBTOTAL	9.00	90,000
Project Management	Administrative Support Services		5,000
	Specialists Travel		
	Air Faire 6 @ \$2,000		12,000
	Per Diem 36 weeks		21,600
Training	Reference Materials		2,000
	Training Materials		8,000
	Training Equipment		4,000
	Overseas Study, Study Tours and Work Study Tours, 4,400 per month	<u>10</u>	<u>44,000</u>
	SUBTOTAL	<u>10</u>	<u>96,600</u>
	TOTAL	19	186,600
	Inflation 20%	--	37,320
		====	=====
	GRAND TOTAL	19	223,920

APPENDIX A

Persons Contacted

Government of Jordan

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APPENDIX B

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APPENDIX C

Model Curriculum Vitae of Candidate for Project Director

Job Title: Project Director

Responsible to: Project Board of Advisors

Job Scope:

- To direct the implementation of project activities in accordance with project work plan.
- To provide liaison with donor(s) and Board of Advisors on project activities.
- To direct preparation of Phase Two and Three documents and carry out negotiations with donor(s).

Major Activities:

- Monitor on-going project activities and where necessary, develop alternative priorities, procedures or standards to keep project moving ahead.
- Conduct negotiations with all service, training, and educational organizations regarding their needs and their obligations to the project.
- Serve as chief administrator of all personnel and financial matters pertaining to project.
- Develop and maintain liaison with bilateral and international organizations involved with water sector training activities.

Academic
Qualifications: M.S. Degree

Professional
Qualifications: A minimum of ten years experience in project development and implementation in any sector, including the conceptualization of projects, development of work plans, setting priorities, monitoring activities, troubleshooting problems in implementation, and managing of diverse groups in accomplishing agreed upon project goals. A minimum of ten years experience in a water sector type of organization.

Personal

Qualifications: To be effective the project director must be totally committed to the training project and its vital role in the success of water projects in Jordan. He/she should have demonstrated the ability to provide leadership and influence others in agreeing with and implementing agreed upon objectives. The person should have sufficient stature in the water sector, training and education community in Jordan that his/her credibility will not be questioned.

APPENDIX D

Model Curriculum Vitae of Candidate for Training Program Coordinator

- Job Title: Training Program Coordinator
- Responsible to: Project Director with on-going interaction with training program specialist.
- Job Scope:
- To assist Project Director in implementation of project activities in accordance with project work plan.
 - To direct training system development of project.
 - To assign tasks and direct project specialists and personnel from cooperating Jordanian organizations in their project activities.
- Major Activities:
- Direct the development and implementation of a human resource needs assessment system, including the setting of training priorities and training of water sector agencies to do this
 - Direct the development and implementation of task analysis and performance appraisals, including training personnel to carry out these tasks
 - Direct the development of training programs based on performance-based training and experiential learning techniques; set standards for performance and evaluation of performance, and train project staff to do this
 - Institute a series of seminars on performance oriented and experiential learning methods for staffs of Jordanian training and education organizations and water sector organizations
 - Direct the development of training policies
 - Direct the development and implementation of a system to qualitatively and quantitatively evaluate training effectiveness

- Direct the evaluation and adaptation of training materials used elsewhere to meet specific training needs in Jordan
- Develop and implement a system for the placement of personnel in study tours or work study tours
- Supervise the development of a register of external institutions providing courses, programs or other appropriate training opportunities
- Conceptualize and implement the development of an information center for training materials for the water sector

Academic

Qualifications:

- Certificate of the vocational secondary school in a field related to the water sector
- Technician diploma from a post-secondary technical institute (polytechnic or community college).
- Bachelors degree in vocational education
- At least one course in training methodology and theory

Professional

Qualifications:

- Five years practical experience in a technical area related to the water sector.
- Four years full-time experience as a trainer, with practical application of:
 - a. Needs analysis
 - b. Task analysis
 - c. Performance problem solving
 - d. Training course development
 - e. Training delivery
 - f. Evaluation
 - g. Training of trainers

Personal

Qualifications:

To be effective the training program coordinator should be personally committed to the training project and its critical role in the success of water projects in Jordan. He/she should have demonstrated the ability to work with and influence others and

should be willing to work with patience and
tack with people at all levels from laborer
to official. The individual should be self-
reliant and above all have the desire and
ability to help others to become profes-
sionally self-sufficient.

APPENDIX E

Model Curricula Vitae of Candidates for Operation and Maintenance, Process and Plant Management Trainers

- Job Titles:
- Operation and Maintenance Trainer
 - Process Trainer
 - Plant Management Trainer
- Responsible to: Training Program Coordinator
- Job Scope:
- To develop training materials and programs
 - To implement training programs
- Major Activities:
- Carry out needs assessments
 - Carry out task analyses
 - Carry out performance appraisals
 - Develop training materials
 - Develop training programs
 - Deliver training on and off the job
 - Evaluate training effectiveness
- Academic
Qualifications: None required
- Professional
Qualifications:
- Five years practical experience in their area of technical expertise.
 - Two years direct experience in training in their technical area during their work experience.
 - Demonstrated expertise in analyzing performance in verbal communications with workers.
- Personal
Qualifications: These persons must be committed to training and have a history of their ability to work with others in improving their performance.

This must include demonstration of patience and tact with workers at all levels. The persons should be self-reliant and have high standards for him/herself and others.

APPENDIX F

Position Description - Senior Training Specialist

- Job Title: Senior Training Specialist
- Responsible to: Project Director with on-going interaction with training program coordinator.
- Job Scope:
- To assist with continuous implementation of project activities in accordance with project work plan
 - To provide training system development advice to project
 - To assist project specialists and support personnel in development of training
 - To direct the activities of the technical specialists
- Major Activities:
- Assist with the development and implementation of a human resource needs assessment system, including the setting of training priorities and training of water sector agencies to do this
 - Assist with the development and implementation of task analysis and performance appraisals, including training personnel to carry out these tasks
 - Develop training programs based on performance-based training and experiential learning techniques; set standards for performance and evaluation of performance, and train project staff to do this
 - Conduct seminars on performance oriented and experiential learning methods for staffs of Jordanian training and education organizations and water sector organizations
 - Assist with the development of personnel and training policies
 - Develop and implement a system to qualitatively and quantitatively evaluate training effectiveness

- Assist with the evaluation and adaptation of training materials used elsewhere to meet specific training needs in Jordan
- Assist with the placement of personnel in study tours or work study tours
- Maintain a register of external institutions providing courses, programs or other appropriate training opportunities
- Assist with the development of an information center for training materials for the water sector

Academic

Qualifications: M.A. degree in training-related field desirable but exceptional experience in training would be considered.

Professional

Qualifications: A minimum of ten years experience in developing training systems in settings similar to those of the water sector of Jordan with specific experience desired in work study, technical training, and management training; experience in diagnosing training needs and planning, designing, delivering and evaluating training with special emphasis on performance-based or experiential learning.

Personal

Qualifications: To be effective the senior training advisor should be personally committed to the training project and its critical role in the success of water projects in Jordan. He/she should have demonstrated the ability to work with and influence others and should be willing to work with patience and tact with people at all levels from laborer to official. The individual should be self-reliant and above all have the desire and ability to help others to become professionally self-sufficient.

APPENDIX G

Position Description - Technical Specialist

Job Title: Technical Specialists
Operation and Maintenance Technical Specialist
Process Technical Specialist
Plant Management Specialist

Responsible to: Senior Training Specialist

Job Scope:

- To provide technical assistance in own area of expertise.
- To assist with development of training materials and training delivery
- To assist Jordanian counterparts in their development as trainers.

Major Activities:

- Assist with the development and implementation of a human resource needs assessment system.
- Assist with the development and implementation of task analysis and performance appraisals.
- Develop training programs based on performance-based training and experiential learning techniques; set standards for performance and evaluation of performance.
- Assist with the evaluation and adaptation of training materials used elsewhere to meet specific training needs in Jordan.
- Assist with the placement of personnel in study tours or work study tours.
- Assist Jordanian counterparts in the development of their training capabilities

Academic

Qualifications: AA, AS, BA or BS degree

Professional

Qualifications: A minimum of ten years of practical experience in their area of technical expertise. At least two years of involvement in train-

ing at the community college or vocational training level, or on-the-job training. Experience with performance based or experiential learning procedures would be required.

Personal

Qualifications: To be effective the Technical Specialist should be personally committed to the performance based philosophy of training. He/she should have demonstrated the ability to work with and influence others and should be willing to work with patience and tact with people at all levels from laborer to official. The individual should be self-reliant and above all have the desire and ability to help others to become professionally self-sufficient.

APPENDIX H

Samples of Training Courses for Immediate Implementation

Content for the following courses is discussed below:

Chlorination

Pumping and Piping

Electric Power

Daily Operational Control

Emergency Procedures

Primary Sedimentation

Aeration

Secondary Sedimentation

First Stage Digestion

The approach to be used in the training courses will be based on well detailed performance objectives. That is, the knowledge and skills of the trainees after training is described along with the conditions under which the trainee must perform and the level of performance required.

Exhibit 1 lists a set of objectives for training in primary sedimentation and Exhibit 2 for pumping and piping.

Exhibits 3, 4 and 5 show detailed breakdowns of how an objective is further developed for objectives relating to primary sedimentation as well as the guidance given to the trainee and trainer for the conduct of the training. Exhibits 6 and 7 show similar information for training on pumping and piping, and Exhibit 8 provides information for maintaining daily operational control.

As stated earlier, this approach and its level of detail indicate the level of expertise needed both from the training viewpoint as well as the technical content viewpoint from the advisors, project staff and training/education and water sector organizations assisting with implementation.

APPENDIX.H - EXHIBIT 1

OBJECTIVES FOR PUMPING AND PIPING

No.	Objective
1.	Identify the pumping and piping unit.
2.	Describe the pumping and piping process in technical and nontechnical terms.
3.	Describe the safety procedures for the pumping and piping unit and explain how the procedures protect employees and visitors.
4.	Identify the components of a pumping and piping unit. Explain the purpose of each component, how the component works and why it is important.
5.	Describe the normal operation procedures for pumping and piping unit components.
6.	Perform the normal operation procedures for the pumping and piping unit.
7.	Describe and perform the start-up and shut-down procedures for the pumping and piping unit.
8.	Describe the emergency operation procedures for the pumping and piping process.
9.	Describe the preventive maintenance procedures for pumping and piping unit.
10.	Perform the preventive maintenance procedures for the pumping and piping unit.
11.	Describe the corrective maintenance procedures for the pumping and piping unit components.
12.	Perform the corrective maintenance procedures for the pumping and piping unit components.
13.	Perform the safety procedures for the pumping and piping unit and demonstrate how they protect employees and visitors.
14.	Compare various types pumping and piping units.

15. Name and locate the components of the pumping and piping unit. Explain the normal operation procedures, the purpose of each component, how the component works and why it is important.
16. Perform emergency operation procedures for the pumping and piping unit.

APPENDIX H - EXHIBIT 2

PUMPING AND PIPING TRAINING ACTIVITIES (KNOWLEDGE)

Item	Content														
OBJECTIVE:	Describe the normal operation procedures for the pumping and piping unit components.														
CONDITIONS:	Given a pumping and piping unit or slides or photographs of a pumping and piping unit, a list of components of the unit, a checklist of characteristics and a normal operation procedures manual.														
ACCEPTABLE PERFORMANCE:	<p>The trainee will</p> <p>Describe the characteristics of each component which the operator checks to determine whether the component is functioning normally, commenting on:</p> <table> <tr> <td>capacity</td><td>odor</td></tr> <tr> <td>color</td><td>position</td></tr> <tr> <td>corrosion</td><td>pressure</td></tr> <tr> <td>exfiltration</td><td>sound</td></tr> <tr> <td>flow</td><td>temperature</td></tr> <tr> <td>infiltration</td><td>vibration</td></tr> <tr> <td>motion</td><td></td></tr> </table> <p>Name the sense (i.e. smell, sound, etc.) or indicator which monitors each characteristic.</p> <p>Explain how often the characteristics of each component must be checked and why the component must be checked on this schedule.</p> <p>Describe what an operator does if there are indications that it is not functioning normally, including:</p> <ul style="list-style-type: none"> making adjustments deciding about corrective maintenance reporting to supervisors reporting in writing <p>Explain why a component's characteristics must be returned to normal.</p> <p>Describe routine sampling for the primary sedimentation process.</p>	capacity	odor	color	position	corrosion	pressure	exfiltration	sound	flow	temperature	infiltration	vibration	motion	
capacity	odor														
color	position														
corrosion	pressure														
exfiltration	sound														
flow	temperature														
infiltration	vibration														
motion															

List routine calculations for the primary sedimentation process.

Describe routine procedures for recording data.

INSTRUCTOR
ACTIVITY:

1. Describe the characteristics of the components of the pumping and piping unit.
2. Describe the normal operation procedures for the pumping and piping unit. Use color photographs or slides.
3. Describe the normal operation procedures during a slide show of components of the pumping and piping unit.
4. Describe and explain the normal operation procedures during a plant tour. Listen to the trainee's description of the procedures.

TRAINEE
ACTIVITY:

1. Develop a checklist, listing the components of the pumping and piping unit and their normal characteristics.
2. Develop a manual of normal operation procedures.
3. Describe the normal operation procedures during a slide show of components of the primary sedimentation unit.
4. Observe and describe the normal operation procedures during a plant tour.

APPENDIX H - EXHIBIT 3

START-UP AND SHUT DOWN PROCEDURES FOR PUMPING AND PIPING (KNOWLEDGE AND SKILL)

Item	Content
OBJECTIVE:	Describe and perform the start-up and shut-down procedures for the pumping and piping unit.
CONDITIONS:	Provide a mock-up, model or photograph of the components of a pumping and piping unit and the components of a pumping and piping unit with the manufacturer's operation manual.
ACCEPTABLE PERFORMANCE:	The trainee will Start up and shut down a pumping and piping unit following the manufacturer's instructions.
INSTRUCTOR ACTIVITY:	<ol style="list-style-type: none">1. Demonstrate and perform the start-up procedures in a treatment plant.2. Demonstrate and perform the shut-down procedures in a treatment plant.3. Observe the trainee performing the start-up procedures in a treatment plant.4. Observe the trainee performing the shut-down procedures in a treatment plant.5. Observe the trainee as he evaluates his start-up procedures.6. Observe the trainee as he evaluates his shut-down procedures.
TRAINEE ACTIVITY:	<ol style="list-style-type: none">1. Describe the start-up procedures in a dry run in a treatment plant.2. Describe the shut-down procedures in a dry run in a treatment plant.3. Perform the start-up procedures in a treatment plant.4. Perform the shut-down procedures in a treatment plant.

5. Evaluate the operation of the pumping and piping unit to determine whether correct start-up procedures have been used. Use the normal operation procedures manual which the trainee has developed.
6. Evaluate the operation of the pumping and piping unit to determine whether correct shut-down procedures have been used. Use the normal operation procedures manual which the trainee has developed.

APPENDIX H - EXHIBIT 4
OBJECTIVES FOR PRIMARY SEDIMENTATION

No.	Objective
1.	Identify primary sedimentation unit.
2.	Describe the primary sedimentation process in technical and nontechnical terms.
3.	Describe the safety procedures for the primary sedimentation unit and explain how the procedures protect employees and visitors.
4.	Identify the components of a primary sedimentation unit. Explain the purpose of each component, how the component works and why it is important.
5.	Describe the normal operation procedures for the primary sedimentation unit components.
6.	Perform the normal operation procedures for the primary sedimentation unit.
7.	Describe and perform the start-up and shut-down procedures for the primary sedimentation unit.
8.	Describe the emergency operation procedures for the primary sedimentation process.
9.	Describe the preventive maintenance procedures for the primary sedimentation unit.
10.	Perform the preventive maintenance procedures for the primary sedimentation unit.
11.	Describe the corrective maintenance procedures for the primary sedimentation unit components.
12.	Perform the corrective maintenance procedures for the primary sedimentation unit components.
13.	Perform the safety procedures for the primary sedimentation unit and demonstrate how they protect employees and visitors.
14.	Compare various types of primary sedimentation units.
15.	Name and locate the components of the primary sedimentation unit. Name and select reference materials which explain the normal operation procedures, the purpose of

each component, how the component works and why it is important.

16. Perform emergency operation procedures for the primary sedimentation unit.

APPENDIX H - EXHIBIT 5

PRIMARY SEDIMENTATION TRAINING ACTIVITIES
(KNOWLEDGE)

Item	Content														
OBJECTIVE:	Describe the normal operation procedures for the primary sedimentation unit components.														
CONDITIONS:	Given a primary sedimentation unit or slides or photographs of a primary sedimentation unit, a list of components of the unit, a checklist of characteristics and a normal operation procedures manual.														
ACCEPTABLE PERFORMANCE:	<p>The trainee will</p> <p>Describe the characteristics of each component which the operator checks to determine whether the component is functioning normally, commenting on:</p> <table><tr><td>biological growth</td><td>position</td></tr><tr><td>color</td><td>pressure</td></tr><tr><td>corrosion</td><td>sound</td></tr><tr><td>motion</td><td>temperature</td></tr><tr><td>odor</td><td>vibration</td></tr></table> <p>Name the sense or indicator which monitors each characteristic.</p> <p>Explain how often the characteristics of each component must be checked and why the component must be checked on this schedule.</p> <p>Describe what an operator does if the characteristics of a component indicate that it is not functioning normally, including:</p> <table><tr><td>making adjustments</td></tr><tr><td>deciding about corrective maintenance</td></tr><tr><td>reporting to supervisors</td></tr><tr><td>report in written records</td></tr></table> <p>Explain why a component's characteristics must be returned to normal.</p> <p>Describe routine sampling for the primary sedimentation process.</p>	biological growth	position	color	pressure	corrosion	sound	motion	temperature	odor	vibration	making adjustments	deciding about corrective maintenance	reporting to supervisors	report in written records
biological growth	position														
color	pressure														
corrosion	sound														
motion	temperature														
odor	vibration														
making adjustments															
deciding about corrective maintenance															
reporting to supervisors															
report in written records															

List routine calculations for the primary sedimentation process.

Describe routine procedures for recording data.

INSTRUCTOR
ACTIVITY:

1. Describe the characteristics of the components of the primary sedimentation unit.
2. Describe the normal operation procedures for the primary sedimentation unit. Use color pictures.
3. Describe the normal operation procedures during a slide show of components of the primary sedimentation unit.
4. Describe and explain the normal operation procedures during a plant tour. Listen to the trainee's description of the procedures.

TRAINEE
ACTIVITY:

1. Develop a checklist, listing the components of the primary sedimentation unit and their normal characteristics.
2. Develop a manual of normal operation procedures.
3. Describe the normal operation procedures during a slide show of components of the primary sedimentation unit.
4. Observe and describe the normal operation procedures during a plant tour.

APPENDIX H - EXHIBIT 6

PRIMARY SEDIMENTATION TRAINING ACTIVITIES (SKILL)

Item	Content
OBJECTIVE:	Perform the normal operation procedures for primary sedimentation unit.
CONDITIONS:	Given a primary sedimentation unit, the manual of normal operation procedures which the trainee has developed for the primary sedimentation unit and basic references.
ACCEPTABLE PERFORMANCE:	<p>The trainee will</p> <p>Check and evaluate the characteristics of each component, explaining his actions.</p> <p>Perform the procedures which an operator follows if the characteristics of a component indicate that it is not functioning normally.</p> <p>Perform the routine sampling.</p> <p>Perform the routine calculations.</p> <p>Perform the routine record keeping.</p>
INSTRUCTOR ACTIVITY:	<ol style="list-style-type: none"> 1. Observe the student demonstrating normal operation procedures in a dry run in a treatment plant. 2. Observe the trainee performing normal operation procedures in a treatment plant.
TRAINEE ACTIVITY:	<ol style="list-style-type: none"> 1. Demonstrate the normal operation procedures in a dry run in a treatment plant. 2. Perform and explain the normal operation procedures in a treatment plant.

APPENDIX H - EXHIBIT 7

START-UP AND SHUT-DOWN PROCEDURES FOR A PRIMARY SEDIMENTATION
(KNOWLEDGE AND SKILL)

Item	Content
OBJECTIVE:	Describe and perform the start-up and shut-down procedures for the primary sedimentation unit.
CONDITIONS:	Give a mock-up, model or photograph of a primary sedimentation unit and a primary sedimentation unit with the manufacturer's operation manual.
ACCEPTABLE PERFORMANCE:	The trainee will Start up and shut down a primary sedimentation unit following the manufacturer's instructions.
INSTRUCTOR ACTIVITY:	<ol style="list-style-type: none">1. Demonstrate and perform the start-up procedures in a treatment plant.2. Demonstrate and perform the shut-down procedures in a treatment plant.3. Observe the trainee performing the start-up procedures in a treatment plant.4. Observe the trainee performing the shut-down procedures in a treatment plant.5. Observe the trainee as he evaluates his start-up procedures.6. Observe the trainee as he evaluates his shut-down procedures.
TRAINEE ACTIVITY:	<ol style="list-style-type: none">1. Describe the start-up procedures in a dry run in a treatment plant.2. Describe the shut-down procedures in a dry run in a treatment plant.3. Perform the start-up procedures in a treatment plant.4. Perform the shut-down procedures in a treatment plant.

5. Evaluate the operation of the primary sedimentation unit to determine whether correct start-up procedures have been used. Use the normal operation procedures manual which the trainee has developed.
6. Evaluate the operation of the primary sedimentation unit to determine whether correct shut-down procedures have been used. Use the normal operation procedures manual which the trainee has developed.

APPENDIX H - EXHIBIT 8

PROCESS CONTROL
(KNOWLEDGE)

Item	Content
OBJECTIVE:	Describe procedures for recommending operational changes.
CONDITIONS:	Given a plant, its operational requirements and its specifications, including: <ul style="list-style-type: none">effluent requirementsreceiving water requirementsreliability requirements
ACCEPTABLE PERFORMANCE:	The trainee will <ul style="list-style-type: none">Define design performance, actual performance and problem analysis.List the references used to recommend operational changes, including:<ul style="list-style-type: none">as-built printsdaily plant logseffluent standards and receiving water standardsmaintenance manualsmaintenance schedulesmaintenance service recordsplant operations manualsplant performance guidesplant specificationsList the kinds of information used to recommend operational changes, including:<ul style="list-style-type: none">chemical usagecosteffluent quality requirementsequipment historyequipment in the area of changeflowmeter readingshourmeter readingskinds of personnellaboratory reportslocation of changesmonitoring recording charts

number of personnel
performance of personnel
performance of process units
personnel changes
personnel in the area of change
policy changes
power meter readings
rate of operational changes
reliability requirements
reports of plant performance
sampling procedures
shift schedules
utility requirements

Describe daily operational changes indicated by the information, by the daily and monthly plant performance reports and regulatory agency reports. Note the acceptable ranges of data.

Explain the reasons for the changes, commenting on:

changing imposed standards
experimentation
influent quality
influent quantity
personnel morale or changes
quality control schedule and analysis
record keeping

Describe how the changes should be implemented, commenting on:

number of units in service
process flow configurations
process loadings
recycling changes
upsets

**INSTRUCTOR
ACTIVITY:**

1. Explain the meaning of design performance and actual performance. Define problem analysis.
2. Display and discuss the references used to recommend operational changes.
3. Display and discuss the information used to recommend operational changes.
4. Describe the procedures to follow when deciding whether operational changes are indicated by the reports and information.

5. Describe operational changes and why the changes are necessary.
6. Describe how the recommended changes should be implemented.

TRAINEE
ACTIVITY:

1. Define the special terms.
2. Examine the references. Develop a reference checklist.
3. Examine the information. Develop a checklist.
4. Analyze daily and monthly performance and regulatory agency reports and other information, noting the ranges of the data.
5. Describe operational changes indicated, explaining the decision.
6. Describe the implementation of recommended changes.

APPENDIX I

Subject Areas to be Included in Possible Study Overseas Programs, Study Tours and Work-Study Programs

Operations and Maintenance

- Normal Operating Procedures
- Troubleshooting Procedures
- Preventive Maintenance Procedures
- Corrective Maintenance Procedures
- Process Control
- Laboratory Control Procedures
- Emergency Procedures

Management

- Administrative Procedures
- Personnel Policies
- Delegation Policies
- Time Management
- Performance Based Supervision
- Decision Making
- Productivity Improvement
- Scheduling Methods
- Long Range Planning
- Emergency Planning
- Disaster Planning
- Performance Appraisal
- Productivity Management
- Financial Management and Billing
- Rate Analysis